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ABSTRACT

Higher education has traditionally been defined as a two dimensional affair concerned with content (curriculum) and pedagogy (instructional design). Information technologies are transforming the educational enterprise into a three-dimensional universe through the diversification of instructional delivery systems. The success of higher education in the virtual universe will depend upon the intelligent and creative application of these technologies. The resulting "Virtual University" will foster an emergent reality that will transform the learning experience, while making higher education more accessible, relevant, and affordable. A variety of societal factors--demographic, political, corporate, and technological--are converging to accelerate the creation of virtual universities. Existing efforts by entrepreneurs, educators, corporations, and politicians to create virtual learning environments are examined, providing a survey of the increasingly competitive marketplace in which universities must be prepared to deliver their unique educational experience. The components needed to ensure that higher education institutions continue to promote the highest standards of intellectual achievement, freedom and responsibility in the virtual environment are identified. A variety of roles and contributions librarians can fulfill in transforming institutions of higher education into virtual learning environments are outlined. Reproductions of visual aids are appended. (Contains 32 references.) (Author)

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The Virtual University: Creating an Emergent Reality

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Dedicated in loving memory to:

C. Allison Salley, (January 18, 1936 - March 26, 1996)

Abstract

Higher Education has traditionally been defined as a two dimensional affair concerned with content (curriculum) and pedagogy (instructional design). Information technologies are transforming the educational enterprise into a three-dimensional universe through the diversification of instructional delivery systems. The success of higher education in the virtual universe will depend upon the intelligent and creative application of these technologies. The resulting "Virtual University" will foster an emergent reality that will transform the learning experience, while making higher education more accessible, relevant, and affordable.

A variety of societal factors - demographic, political, corporate, and technological - are converging to accelerate the creation of virtual universities. Existing efforts by entrepreneurs, educators, corporations, and politicians to create virtual learning environments are examined, providing a survey of the increasingly competitive marketplace in which universities must be prepared to deliver their unique educational experience. The components needed to ensure that higher education institutions continues to promote the highest standards of intellectual achievement, freedom and responsibility in the virtual environment are identified. A variety of roles and contributions librarians can fulfill in transforming institutions of higher education into virtual learning environments are outlined.

Introduction

When I first began thinking about submitting a paper on this topic some months ago, soon after the Western Governor's released their proposal for creating an inter-

state cooperative virtual university, I wasn't certain that my message today was going to be one of hope. In fact, one of the titles I considered for this presentation clearly reflects this fact: "The Virtual University: Tomorrow's Reality or Merely a Nightmare?" I share it with you because I suspect it may come close to capturing what, on a bad day, any one of us in this room might come close to thinking about the future.

But, my message today is one of hope. I would like to share with you a vision of higher education in which technology is not the cause of our demise, but rather the catalyst for extending, in a significant and positive way, the impact of academe on American society.

I. The Three Dimensions of a Virtual Learning Environment

In its current manifestation, higher education can be characterized as a two-dimensional affair, concerned with content (curriculum) and pedagogy (instructional design). Defining the content of higher education has been primarily the role of faculty in degree-granting academic departments and cross-disciplinary units. Degree-programs are designed to ensure breadth and comprehensiveness in the scope of knowledge to which students will be exposed, and to establish expectations for the areas in which students will be asked to demonstrate an ability to think and explore

independently. Significantly, these programmatic decisions focus upon defining the broad areas of research and theory to be covered in a course or program, not selecting from among the body of research and theory in a discipline which are considered acceptable to teach.

Within this structure, individual faculty are expected to exercise professional judgment regarding the selection of specific course material, the establishment of learning objectives and the criteria by which students will demonstrate mastery. This practice is based upon the assumption that faculty have access to, and bear responsibility for staying informed on the latest research and theory in the areas of expertise for which they have teaching responsibilities.

Pedagogy, or instructional design, is the second cornerstone of the educational enterprise. Yet, we do not have to look back too far in the history of higher education to find a time when faculty were much less concerned with incorporating a variety of pedagogical techniques into classroom instruction; a time when higher education was much more of a one dimensional affair, concerned primarily with content alone. Higher education has been heavily criticized for relying too heavily upon lecture-style instruction, but faculty have made significant progress towards combining active and collaborative learning strategies, group projects, and student presentations with more traditional

pedagogical techniques to enrich the instructional environment of the higher education classroom.

Like specific course content, pedagogical design is the responsibility of individual faculty members. Support services and reward structures have been put in place to ensure that faculty develop the expertise and skills they need to create engaging classroom learning environments. Campus teaching & learning centers offer guidance and continuing education for faculty members wanting to expand their familiarity and expertise in applying a range of pedagogical and instructional techniques. Initiatives by national organizations such as the American Association of Higher Education strive to heighten the importance afforded pedagogical effectiveness in the tenure and promotion process. Thus, in the current educational market, every faculty member is expected to grapple not only with content, but also with the pedagogical dimensions of the educational enterprise.

Electronic information technologies are now adding a third dimension to higher education, creating opportunities for faculty to foster instruction by means of virtual learning environments. The strategic utilization of telecommunications networks, together with instructional authoring software, is resulting in the creation of online methods of teaching and learning that will transform higher education, making it more accessible, relevant, and effective for a more receptive, motivated, and cohesive

student population. Through the addition of electronic delivery methods, the two-dimensional educational enterprise, is being transformed into a virtual learning environment in which faculty are able to share their expertise with a larger and more diverse population of students, and engage these students in more collaborative learning processes.

Education in the virtual environment will be as dramatically different as a three-dimensional object is from a photograph. Information technology, through the exploitation of virtual learning environments, and the intelligent application of pedagogical theory, can extend higher education's impact on American society to an extent we have been unable to realize in the past. Higher education will no longer be static, impersonal, or delimited by time or space. Learning will be fostered not only in a separate places we call universities, but rather in all the places were people live, work and recreate.

II. Higher Education as an Emergent Reality

In his book, Out of Control, Kevin Kelly (1994), the executive editor of Wired magazine, writes eloquently about the emergent reality that can result when people with different expertise and experiences are brought into new social and intellectual encounters through the application of digital technologies. The concept of emergence itself is not new: It has been used by scholars since the early 1900s

to describe and interpret a growing number of complex, biological systems, from bee hives to consciousness, in which the behavior and products that emerge from the collective can be neither predicted nor accounted for by simply examining the qualities and characteristics of the individual, contributing parts. In the words of the philosopher C. Lloyd Morgan, emergence "is best regarded as a qualitative change of direction, or critical turning-point, in the course of events." As Kelly explains, "here 2 + 2 does not equal 4; it does not even surprise with 5. In the logic of emergence, 2 + 2 = apples." (Kelly, 1994, p.12)

But although the concept of emergence is not new, Kelly's inspiration lies in the recognition that information technologies provide the necessary tools for realizing emergence on a human scale far greater than any previously possible. The essential hardware of emergence is the intricate interconnectedness of individual, diverse parts. "Emergence requires a population of entities, a multitude, a collective, a mob, more". (Kelly, 1994 p.20) It is this kind of complex, distributed, undirected, unpredictable organization which permits bees to swarm collectively, geese to flock intelligently, memory to arise from perception, and music to be extracted from notes formed independently. Through the expansion of telecommunications networks, we are realizing the creation of human networks more vast, integrated, and interactive than have ever been possible without the assistance of technology.

It is this emergent reality, and the culture of interconnectedness spawned by the formation of vast, integrated, and interactive human networks, that will transform higher education. Indeed, we are already witnessing some of the positive impact of this networking on the community of scholars and students in higher education. Scholarly discussion lists are perhaps the simplest application of a networked environment. Whether limited in membership, or linking scholars from across the globe, electronic discussion groups "foster an unprecedented sense of collegiality" (DeLoughry, 1994, p. A26). By bringing together a virtual community of scholars, many of whom may be physically isolated from others who share common intellectual interests, these discussion lists provide a forum for discussing the latest advances in a discipline, thereby affecting an acceleration of research and theoretical insights.

The impact of this connectedness is having a significant affect upon the quality of students' learning experiences, as well. Because most scholarly discussion lists welcome the membership of graduate and undergraduate students, students have access to a level of scholarly communication never before available to them. Frank Conlon, a professor of history at the University of Washington identifies this potential to "tear down walls in academce that normally separate well-known scholars from graduate students who are entering a field" as one of the primary

benefits of mailing lists. Teaching students to identify and participate in discussion lists has provided librarians a new method of introducing students to the challenge of understanding and entering into the processes of scholarly communication.

Electronic discussion lists are also being used by faculty as a way of extending and supplementing classroom interaction, and as an integral part of the learning environment for courses being developed for delivery online. These faculty and students report a similar heightened sense of community and collaboration fostered by the networked environment. Students can continue discussions begun in the classroom, or collaborate to solve problems and understand course materials.

Interacting with students through the virtual environment of electronic distributions lists, transforms the role of faculty to that of a guide, helping students find answers to the questions themselves. Student roles change too, as they begin to contribute to the learning processes of their peers in a more active way. Students who were reluctant to contribute to discussion and problem-solving in a classroom environment, have shown greater amounts of participation in electronic discussion forums. Preliminary reports of student performance outcomes and learning mastery in these online environments reinforce the prediction that a virtual learning approach can improve

learning and allow students and faculty to use their time more productively. (Wallace, 1994).

Fostering learning in a virtual environment will require faculty to establish alternative methods of engaging students both socially and intellectually. Faculty will be challenged to interact with students in new ways, and to create occasions for meaningful encounters in a virtual learning environment. To accomplish this, faculty must not only master new skills for delivering course content, they must also acquire an understanding of the learning theory that applies in a virtual setting. Faculty will be required to think differently about both the content of their curriculum, and the pedagogical techniques they use to engage students in the learning process. To succeed in these endeavors, faculty will need specialize support services to help them acquire new technological skills, as well as familiarize themselves with pedagogical approaches to instruction appropriate to the virtual learning environment.

III. Factors driving the creation of Virtual Universities

All other factors remaining constant, faculty and institutions of higher education would likely enjoy a slow evolution toward virtual learning environments. But, as it is, there are an overwhelming multitude of factors affecting the higher education environment which virtually ensure that

the move to create virtual universities will be accelerated at a rate exceeding most other educational reforms. These factors extend from all segments of our society: educational, political, corporate and technological.

A. Changes in Student demographics and Expectations

The demographics and expectations of the student populations in American institutions of higher education have changed significantly in the last 30 years. The proportion of non-traditional students has grown dramatically, as the need for life-long learning has increased, and a greater number of students are taking classes and completing degree programs while working full time jobs. These students bring a wider range of experiences and expectations to the learning process. They expect there to be an implicit relationship between their employment and the coursework they take, more active involvement in the learning process, and greater flexibility in the scheduling and delivery of coursework. Increasingly, students, both traditional and non-traditional, expect education to engage them through the incorporation of information technologies and electronic media, an expectation that will extend to all students as technology permeates K-12 education.

Efforts on the part of higher education institutions to invest in information technologies for supporting instruction and scholarly communication are creating new

strains on budgets. At the same time, these institutions are being faced with the deterioration of the buildings which make up their campuses. Significantly, the physical infrastructure of America's institutions of higher education have reached the point of disintegration at the same time that information technology is promising alternative methods of carrying out the education, research, and service missions at the heart of higher education. Institutions with insufficient funds for rebuilding the buildings that house their classrooms and offices are facing, simultaneously, demands for constructing the fiber-optic networks needed to connect their faculty and students with the global education and research network.

These financial strains are coming at a time when we are also witnessing an alarming degree of ambivalence among the general population regarding the public finance of higher education, an ambivalence that stems both from a distrust of the societal functions of higher education, and a shift in attitudes about who should bare the cost of an educated society. There has been a significant decrease in public confidence regarding the value and quality of education provided by institutions of higher learning. At the same time, competing social needs relating to crime, racial equality, and domestic relations make it difficult for institutions of higher education to secure a significant portion of available public and private funding. As noted by the Institute for Research on Higher Education at the

University of Pennsylvania (July/August 1994), "The willingness of voters to tax themselves to promote the public good has been replaced by the expectation that 'the public good' will be better served by the amalgam of individual interests and transactions that constitute the marketplace" A greater share of the cost of higher education, therefore, is being shifted from public and private sources to the consumer.

Since 1990, a growing number of corporations have announced the development of comprehensive, in-house training programs which seek to go beyond the scope of traditional staff development efforts by providing integrated, sometime degree-granting, alternatives to programs of instruction offered at institutions of higher education (McNerney, 1994; Marsh, 1995; Owen & Sprow, 1994; Watson, 1995; Wiggenhorn, 1990). The goals of these in-house training programs differ from one corporation to another, as do the particulars of course work and delivery methods, however there are significant similarities among the factors providing impetus for development of these "corporate universities". Since the corporations implementing these programs promote their training programs as alternatives (whether mandatory or voluntary) to higher education, this trend is one which could have a significant impact upon traditional institutions of higher education in the United States.

Many of the efforts to develop corporate universities stem from dissatisfaction with both the skill levels of existing staff, and the relevance of knowledge exhibited by graduates applying for employment. Changes in the nature of work itself are requiring companies to retrain existing staff to perform more highly skilled work, as well as provide basic literacy skills training for some employees. There is also a growing corporate distrust of the value academe places upon exposing students to a broad range of ideas, and developing independent reasoning skills. Increasing emphasis upon proprietary knowledge, and uniform corporate management practices are resulting in less corporate funding of off-site continuing education, and greater investment in providing on-site training. Providing training and education in-house allows corporations to disseminate a common knowledge base, while preserving and transmitting corporate culture. Finally, highly specialized industries are finding that the most relevant research is being funded and reported privately, rather than through the conventional scholarly communication processes. Since faculty and students at colleges and universities do not have access to this research, developing internal curriculum is, therefore, viewed as the only way to keep employees current in their fields. Although most corporate training programs do not yet employ online delivery of instruction, they are creating an impetus for change at institutions of higher education.

Technology developers and vendors have, since the early 80's invested in practices and marketing strategies aimed at accelerating the infusion of instructional technology into all levels of the educational infrastructure. The marketing of technology is thus creating expectations in the general population that education, and access to education, should be as convenient, expedient and accommodating as the innovations of information technology are capable of permitting.

Technology itself is devoid of any social, cultural, political, or legal constraints. Thus the universe created by connecting humans beings virtually through information technology is promoted as a new borderless frontier in which the limitations of our physical universe, together with its social, cultural, political and legal conventions, no longer apply. Yet in reality, these conventions may not simply be left behind in the emergent reality of a virtual world. In fact, these same vendors, who speak eloquently of a future characterized by global access to information, simultaneously market products with six-page licensing agreements which severely constrict access and use of their products. Clearly, "the barriers we face are organizational, not technological" (Ball & Reese, 1994) Still, we are challenged by the potential of an unfettered virtual universe, to find ways of overcoming them.

IV. Models for Constructing a Virtual University

Given the factors compelling the transformation of higher education, and the potential of information technology for transforming the educational enterprise through the creation of virtual learning environments, what might a virtual university look like? One way of addressing this question is to look at existing efforts by entrepreneurs, educators, corporations, and politicians to create virtual learning environments using networked information technologies.

A. Tools for Creating Virtual Learning Environments

Creating a virtual university requires more than simply taking existing curriculum and making it accessible via telecommunications networks. Courses taught through virtual universities must be more than email correspondence courses offered via the Internet. Effective teaching and learning in a networked environment requires development or adaptation of a multi-faceted virtual learning environment. A virtual learning environment (VLE) is an integrated suite of tools for representing course content, engaging student interaction, and providing access to supplementary resource materials. Facilities for promoting faculty-student interaction, as well formal and informal student communication, both in real time and in asynchronous modes

should be provided. One-on-one, as well as multi-user communication should be supported.

Several software products are already available for creating virtual learning environments with some or all of these features. *Lotus Notes* is one such product being employed at a number of Universities, including New York University and UNL (Reinhardt, 1995). The *Lotus Notes* VLE provides passworded access to "electronic 'lectures' delivered as multimedia presentations", course reading materials, an email discussion forum for course participants, and a multi-user "cafeteria" for real-time interaction among students and instructor. Another product, called *CyberCampus* ("Cybercampus demonstrated", December 29, 1995) employees virtual reality technology to provide real time, human interaction among students and faculty within a common virtual space. The College of Marin in Kentfield, California has used this program to create a replica of Ring Mountain which "allows students to learn about earth sciences and archeology by hiking around the virtual mountain". Chaco Communications recently announced the development of Pueblo, a virtual learning environment employed by the Virtual Online University ("Chaco communications", February 8, 1996), while University Online, Inc. developed its own Internet-based VLE for use in its "Academic Partnership Program" ("Virtual Online University", Website). Although most existing VLE software offer limited capabilities, efforts to develop more sophisticated VLE's

are underway. One such effort being pursued by A*DEC, in conjunction with the University of Illinois, will include templates to assist faculty in developing course offering for the virtual environment (A*DEC Board of Directors, March 1996).

B. Using virtual learning environments, many existing institutions of higher education have begun offering online courses either as extensions of existing continuing education programs, or as alternate methods for departments to deliver individual courses. As an initial step toward developing full virtual delivery of instruction, many academic institutions are listing their distance education courses on the Internet through the Globewide Network Academy ("Globewide Network Academy", Website). Not all of the courses listed at this site are delivered online; some are provided through traditional distance education technology.

Since access to a VLE is a requirement for effective delivery of online curriculum, a number of academic institutions are utilizing the services of University Online, Inc. ("University Online, Inc.", Website), an online service provider of electronic, interactive distance education serving the needs of both educational and corporate institutions. Through its "Academic Partnership Program", UOL provides access to more than 160 interactive courses in business, technology, sciences, language arts,

and basic skills. Courses offered through this program are not entirely online, but typically includes interactive instruction modules and test materials accessed through the World Wide Web, supplemented by a textbook, and videotaped lectures.

Another model of a virtual university is Athena University, the higher education arm of the Virtual Online University founded by William Painter, Jr. and Robert Donnelly in 1994 ("Virtual Online University", Website). Athena University is a "classically-oriented", liberal arts institution of higher education, established "to provide high-quality educational opportunities on the Internet as inexpensively as possible" ("Athena University", Website). Employing an open admissions policy, it offers an interdisciplinary curriculum that emphasizes the "development of critical thinking skills", the "free exchange of ideas in a non-physical setting", and the primacy of quality teaching over scholarly research and publishing. The Pueblo software which forms the virtual learning environment for all courses offered by VOU, is a Multi-user Object Oriented (MOO) platform incorporating hypertext, graphics, audio and virtual reality modeling capabilities. Using Pueblo, "instructors can share images, perform music, and give hypertext exams, all while discussing problems and questions with the class using text-based chat" ("Chaco communications", February 8, 1996).

The founders of VOU and Athena University seek to establish a new model for distance education, and a new paradigm for higher education, based on the philosophy that "most successful projects on the net are those that do not try to control the ways in which people interact with each other and with the information on the system" (Athena University Academic Summary, Website). In keeping with this philosophy, Athena University strives to be "non-hierarchical, decentralized, flexible, media-oriented, maintain a minimal administrative detail, and be independent of any one educational or political philosophy." It seeks to attract faculty who believe the primary focus of a University should be its students, and who want to apply the latest developments in computer-mediated technology and the most recent research in learning theory to higher education. While posed to capitalize upon many of the most promising aspects of networked communication, the founders of VOU have been criticized heavily by faculty in traditional institutions of higher education. As noted by Gary E. Miller, assistant vice-president for distance education at Pennsylvania State University, the success of this venture will depend ultimately upon the "content and goals of its curriculum" (Jacobson, 1994, p. A20).

Corporate training and education programs offer yet another model for constructing a "virtual university". Since 1990, a growing number of corporations have developed comprehensive,

in-house training programs which seek to go beyond the scope of traditional staff development efforts by providing integrated, sometimes degree-granting alternatives to programs of instruction offered at institutions of higher education. These programs differ from traditional programs of higher education primarily in the ways they define and control curriculum. The basic model employed by such corporations as Motorola, Texas Instruments, Sprint, Disney, and Gallup is to identify specific content to be presented, then to hire or contract with faculty to deliver a standard curriculum. As articulated by William Wiggenhorn, president of Motorola University, "We don't want [faculty] to teach their version of, say, Effective Meetings; we want them to teach ours" (Wiggenhorn, 1990, p.82). Independent thinking and interpretation of course material is not encouraged either by faculty or students. Wiggenhorn goes on to note that few academics can "deliver on those terms". In addition to ensuring that course content is specifically tailored to the companies' needs, maintaining tight control over course content is viewed as a way to strengthen corporate culture by conveying to employees the methods, goals and beliefs acceptable in a particular organization. Although most corporate training programs do not yet employ online delivery of instruction, they are creating an impetus for change at institutions of higher education.

The Western Governors' proposed regional virtual university is based upon a model similar to the corporate

university model, in which the content of curriculum is driven by the needs of employers & consumers. First proposed in December 1995, the Western Virtual University has been called "a revolutionary step on behalf of technology's potential to extend regional access to higher education" (Johnstone & Krauth, 1996, p. 39). The stated goals of the VU are to expand access to, and reduce the cost of, acquiring formal recognition for skills and knowledge obtained through technology-based learning outside the formal education system ("Goals and Visions for a Virtual University", Website). The proposed university would be "market-oriented", "independent...of those who represent established interests with regard to either the delivery of education or its certification", and "client-centered" - focusing on needs of students and employers rather than instructional providers" ("Goals & Visions", Website, p.3)

The proposed mechanism for accomplishing these goals involves the creation of a "Regional Advisory Group" composed of the governors and their designees drawn from industry, academia, corporate sponsors, and other interested communities ("Design Plan and Workplan for a Virtual University", Website). This advisory group would have responsibility for identifying content areas, expected competencies, and methods of assessing and certifying competencies to be supported by the VU curriculum. Identification of these competencies would involve both content experts, and potential employers of graduates

possessing these competencies. Instructional providers from the business and educational communities would then be invited to submit descriptions of existing programs and courses, as well as bits for developing new materials to address the specific competencies approved by the advisory group. The Advisory Group would further develop specifications for the provision of support services for students in the areas of registration, advising, library services, and financial aid.

This proposal mirrors very closely a model used in Canada in 1993 to establish the Institute for Government Informatics Professionals, a joint venture of the Government of Canada and three Canadian universities (Westcott, 1994). Curriculum for the Institute is set by an Advisory Board; course development and pedagogical issues are managed by a Curriculum Council, and the participating Universities are responsible for course delivery. Although the University community was not initially involved in identifying the knowledge and skills to be addressed by the Institute curriculum, a partnership approach has been used for the development and delivery of specific courses. Faculty "work closely with the Institute to ensure that all courses are customized to meet the unique needs of government information technology professionals" (Westcott, 1994, p. 48).

With so many models developing for the design of virtual universities, it is important that the academic

community identify essential principles for preserving the values and goals of higher education in the virtual education environment. One set of such principles has already been developed by the Western Cooperative for Educational Telecommunications through a grant from the U.S. Department of Education (Johnstone & Krauth, 1996). Entitled "Principles of Good Practice for Electronically Offered Academic Degree and Certificate Programs", they emphasize the importance of continued faculty oversight of curriculum, institutional commitment to role and mission, appropriate application of technology, student access to learning resources, adequate training and support services for course development, standards for faculty-student interaction, and assessment of student learning outcomes.

If the University is to continue to fill its traditional role of promoting the highest standards of intellectual achievement, freedom, and responsibility in our community and our society, we must be prepared to deliver our unique brand of education in an increasingly competitive marketplace. We must be willing, in this environment, to engage in self examination. Yet, above all, the role of higher education in the development of virtual universities must be the preservation of intellectual freedom, independent inquiry, and the courage to challenge societal assumptions. As stated by Gerhard Casper, President of Stanford University, "the main task of the university has been to challenge fundamental assumptions and

practices...the university's commitment is to knowledge and research, not to a particular content or to specific results" (Casper, p.9). Although we will be called upon to utilize new technological tools to achieve these goals, ultimately, the future of higher education is about content, pedagogy and developing minds.

V. The Role of Librarians in the Transformation of Higher Education into a Virtual Learning Institution

One reason the concept of emergent reality is so appealing to me as an educator is that, in many ways, higher education has always been about creating an emergent reality. At its heart, the function of higher education is to bring people together for the exchange of ideas, and to engage in activities that result in new ways of thinking about and understanding our existence. The structures and governance of institutions of higher education have been designed to create an environment in which free inquiry, and the search for knowledge may be carried out unfettered by prejudice or censorship. Networked technologies provide new tools for fostering these goals.

The success of higher education in the virtual universe will depend upon the intelligent and creative application of these technologies. The development of robust Virtual Learning Environments for the delivery of instruction is a fundamental requirement for transforming institutions of

higher education. This includes the incorporation of methods for providing access to sufficient supplementary reference, study and research resources. Tools are being developed for representing information, engendering active learning, and fostering interaction among faculty and students. But as Langdon Winner (1994) charges in his scathing editorial on higher education's embrace of digital technologies, "the amount of work needed to create software that allows a truly open-ended search for knowledge is just not being done" (p.66)

In 1994, William Geoghegan, from IBM's division of Academic Consulting/Higher Education, writing about "the social and psychological factors that underlie the spread of ANY innovation in the use of technology", tried to address the reasons underlying the failure of many faculty to embrace new teaching and learning technologies. He noted that:

> The support systems that most campuses have put into place to foster the deployment of instructional technology were designed by and for the early adopters themselves [a term coined to refer to that 10% of faculty who actively experiment with every technological innovation], under the unstated assumption that all potential adopters needed the same kinds of encouragement, facilities, and support, differing from one another by degree, perhaps, but not by kind."

He proposed that in fact "the next set of potential adopters needs something qualitatively different in the way of support". A great deal has since been written about the inappropriate or inadequate support services provided on academic campuses for fostering the widespread adoption of instructional technologies among faculty. As Steven Gilbert points out, "the level and quality of support that was adequate for the first 5 percent of faculty is probably strained dealing with 15 percent, and will not 'scale up' for the next 70 percent" (Gilbert, 1996, p.19). Thus the development of a campus wide plan for providing faculty support services to encourage the effective integration of technology into curriculum is a critical factor in the development of the academic virtual university.

One method proposed for addressing this need for more and different support for faculty development involves the formation of Faculty Student Support Service Teams (FSSST) composed of technology specialists, librarians, teaching and learning professionals, and one or more student assistants ("Guiding Questions for local TLTR Roundtables", Website). These teams provide "faculty who are trying to improve their teaching and their students' learning through more effective uses of information technology with the full range of support services necessary to make the transition successful" (Gilbert, 1996, p.20). The team approach fosters considerable "cross-training" among team members, and encourages student involvement in shaping the

application of technology for teaching and learning. This approach, which is being encouraged by the American Association for Higher Education's Teaching, Learning & Technology Round Table Program ("Guiding Questions for local TLTR Roundtables", Website), has been successfully implemented on a limited scale at George Mason University.

One thing which this model recognizes is that librarians are well positioned by education, experience and institutional service to play an active role in providing support to faculty for transforming curriculum and pedagogy for the virtual learning environment. The development of systems for the online delivery of instruction is fundamentally about knowledge management. It requires expertise in organizing and packaging information in ways that take into account, and provide adaptability for, the varying information needs of a wide range of learners. Designing effective instructional applications requires an understanding of how students approach information systems, adapt to unfamiliar retrieval interfaces, and assimilate feedback, as well as the types of services and user aids learners need to become proficient at getting the most out of the systems they use. These are all areas of expertise librarians have studied and applied to the organization and development of information systems. The strong service model on which the practice of librarianship is based provides a solid foundation for sharing our expertise with

faculty interested in developing effective systems for teaching and learning.

Information literacy is another area in which academic librarians are prepared to provide faculty support for the development of curriculum in a virtual learning environment. Librarians have been leaders on campus in the education of faculty, staff and students in the use of technology for research and scholarly communication, including the processes of transforming information into knowledge through evaluation and interpretation of source materials. As noted by Bernard R. Gifford, (1992) "the kind of learning that is most important to us in higher education is, in fact, this process of transforming information into knowledge. It is the process of meaning-construction. And in view of the information explosion, no challenge is as urgent today as helping students find meaning in the flood of data that threatens to overwhelm them" (p. 17). Librarians can assist faculty in incorporating pedagogical techniques into the design of online curriculum that will foster the development of these skills in students through the virtual learning environment.

Librarians' role in education has, until now been the management and instruction in the use of the static by-products of the scholarly communication process. The creation of virtual learning environments is a dynamic extension of this scholarly communication process. As the methods of scholarly communication and education have begun

their transformation into virtual systems, the distinction between instructional tools and scholarly products is disappearing. In the virtual environment, knowledge creation, dissemination, retrieval, and interpretation become ongoing processes in which students as well as educators participate at all levels. In the future, as education and scholarly communication continue their transformation into virtual systems, teaching and librarianship will be drawn into an even greater interdependency than they have known in the past. As Bernard R, Gifford (1992) proclaimed, "I believe that the knowledge we have lost in information can be reclaimed at a very particular location - the juncture where librarianship meets pedagogy" (p. 17).

To meet this challenge, librarians need to build upon the strong faculty liaison relations they have developed in the past. They need to increase their familiarity with the of learning theorists such as Roger Shank, and their ties with technology support units on campus. Technology support services can provide much of the technical skills training faculty require for using authoring software, but they are not prepared to provide support of the task of adapting curriculum to new presentation and delivery mechanisms. This is a niche for librarians.

Conclusions

One of the most valuable principles articulated by those who study emergent phenomena relates to the nature of learning itself. As an emergent phenomenon, the very nature of learning fostered by a virtual university will be qualitatively different than that supported by traditional methods of instruction. Organic networks are inherently adaptable, resilient, and conducive to the generation of novelty. The results are far from predictable. Indeed, it is an inherent characteristic of emergence that results of the collective are not predictable from a simple understanding of the individual parts. The only way to know for sure what will result from an organic, networked system is to permit it to operate over time. In the words of Kelly (1994) "Nothing - no computer or mind, no means of mathematics, physics, or philosophy - can unravel the emergent pattern" latent in the many parts of an organic, networked vivisystem without actually "playing it out" (p.13).

One neuron does not make a mind, nor can it be responsible for producing even a single thought. But when connected to others in meaningful ways, significant thoughts and behaviors do result. This is the essence of emergence. As knowledge professionals we have an important role to play in helping to create an virtual environment in which learning, research and service can be responsibly carried out for the benefit of society. An environment which

nourishes intellectual curiosity, in which students and faculty can interact collaboratively in the pursuit of knowledge, and where the values of intellectual freedom and responsibility can be upheld and transmitted. We do not know exactly what the future of virtual universities will be, but we can be important contributors to the emergent realities they will produce.

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The Virtual University: Creating an Emergent Reality

presented by Gail F. Latta
Associate Professor, UNL

- Alternate title:

The Virtual University: Tomorrow's Reality or Merely a Nightmare?

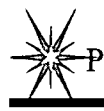
Three Dimensions of a Virtual Learning Environment

Higher Education as a Two Dimensional Affair

- Curriculum (Content)
- Pedagogy (Instructional Design)

Curriculum

- Determined by Faculty
- Ensures breadth and comprehensiveness
- Designed to allow students to think and explore independently
- Defines broad areas of study, not specific content to be taught.



Pedagogy

- Greater variety than in the past
- Lectures supplemented by :
  - active and collaborative learning
  - group projects
  - student presentations
- Faculty responsibility
- Support services & reward structures provided for faculty development

Higher Education as a Three-dimensional Affair

- Virtual Learning Environments
  - telecommunications networks
  - instructional authoring software
  - online delivery methods
- Making Higher Education more:
  - accessible, relevant, and effective for a more
  - receptive, motivated, and cohesive student population

Dramatically Different: 3D vs. Photograph

Two-dimensional environment	Three-dimensional environment
➢ static	➢ learning fostered in all the places where people
➢ impersonal	➢ live
➢ limited by time and space	➢ work
	➢ recreate

Emergent Reality

Out of Control, Kevin Kelly

- Describes the Emergent Reality that can result when people with different expertise and experiences are brought together into new social and intellectual encounters though the application of digital technologies.

Concept of Emergence

- Describes complex, biological systems such as bee hives, flocks, & consciousness
- Accounts for behavior and products that emerge from a collective
- Cannot be predicted or accounted for by simply examining the qualities and characteristics of the individual, contributing parts.

Logic of Emergence

Emergence "is best regarded as a qualitative change of direction, or critical turning point in the course of events"

- C. Lloyd Morgan

- NOT : 2 + 2 = 4
- NOT: 2 + 2 = 5
- RATHER: 2 + 2 = Apples

Emergence in Non-biological Systems

- Kelly's insight: Information Technologies will allow emergence from human systems on a scale not previously possible.
- Telecommunications permit the creation of more vast, integrated and interactive human networks.
- A networked human society will spawn a culture of interconnectedness, and result in new emergent realities.

Emergence in Higher Education

- Scholarly Discussion Groups are simplest examples
  - Link a global community of scholars
  - Foster an unprecedented sense of collegiality
  - Accelerate research and theoretical insights
- Affect quality of students' learning experiences as well:
  - New level of exposure and involvement in scholarly communication.

Electronic Discussion Lists and Classroom Instruction

- Used to supplement classroom interaction
- Integral part of online learning environment
- Positive effects:
  - Allow continuation of "in class" discussions
  - Promote collaborative problem-solving.
  - Faculty becomes "guides"
  - More productive use of student & faculty time
  - Promote heightened sense of community & collaboration

Fostering Learning in a Virtual Environment

- Faculty will be required to think differently about both content and pedagogy
  - master new skills for delivering content
  - understand learning theory in an online environment
  - create meaningful "virtual" encounters
- Specialized support services will be needed

Factors Driving the Creation of Virtual Universities

- Student demographics & expectations
- Information Technology vs. Buildings
- Public ambivalence toward funding higher education
- Development of Corporate Universities
- Marketing strategies of technology vendors

"Clearly, "the barriers we face are organizational, not technological"

-Ball & Reese, 1994

Models for Constructing a Virtual University

More than email correspondence courses!

Virtual Learning Environments

- Integrated suite of tools for representing course content,
- Engaging student interaction (formal & informal)
- Providing access to supplementary resources
- Allow for real-time and asynchronous communication
- Support both one-on-one and multi-user discussions

Software for Constructing Virtual Learning Environments

- Lotus Notes - used by New York U & UNL
- CyberCampus - Virtual Reality-based VLE
  - Replica of King Mountain
- Pueblo - Chaco Communications, Inc.
  - Employed by Virtual Online University
- University Online, Inc.
  - "Academic Partnership Program"
- A*DEC's development project

VLEs: Beginning Efforts by Academic Institutions

- Extensions of Existing Continuing Education programs
- Alternative methods of delivering existing curriculum
- Globewide Network Academy - lists courses from 178 academic institutions, including U Colorado, U Iowa, U. Kansas, U. Oklahoma, and UN-L

University Online, Inc's "Academic Partnership Program"

- Internet-accessible Virtual Learning Environment (VLE)
- Contracts with Academic Institutions to allow them to develop coursework
- 160 courses in business, technology, sciences, language arts, and basic skills.
- Features interactive instruction modules & testing, supplemented by textbook and videotaped lectures.

Virtual Online University's Athena University

- Higher Education arm of VOU
- Founded in 1994 by William Painter, Jr & Robert Donnelly
- "classically-oriented", liberal arts institution
- fosters "free exchange of ideas in a non-physical setting"
- administered entirely over the Internet
- MOO platform provided by Pueblo software

VOU's model of Virtual University

- Philosophy: limit control over interactions on the Net
- Structure: non-hierarchical, decentralized, flexible, media-oriented, minimal administrative detail, independent
- Seeks faculty whose primary focus is teaching
- Uses latest technologies for instruction
- Success will depend upon Curriculum

Corporate "Virtual Universities"

- Define and Control Curriculum
- Ex: Motorola, Texas Instruments, Sprint, Disney, Gallup
- Hire or contract with faculty to delivery corporate curriculum in-house
- Specifically tailored to the company's "needs, culture and strategies"
- Independent interpretation of material is not encouraged

Western Governor's Proposal

- Create a regional Western Virtual University
- Curriculum content driven by needs of employers & consumers
  - Goals: Expand access, reduce costs, grant degrees and certifications
  - Market-oriented, client-centered
  - Independent of established educational interests

Western Virtual University Model

- Regional Advisory Group - governors and their designees
  - identifies content areas, competencies, and methods of assessing and certifying competencies
  - develop specifications for support services
- Instructors from business and educational communities submit bids to teach identified competencies

Canadian "Virtual University"

- Institute for Government Informatics Professionals
  - joint venture of Canadian Government and three Canadian Universities
- Advisory Board sets curriculum
- Curriculum Council manages course development and pedagogical issues
- Universities responsible for course delivery

Preserving the Values & Goals of Higher Education

"Principles of Good Practice for Electronically Offered Academic Degree and Certificate Programs" - WCET

- faculty oversight of curriculum
- institutional commitment to role & mission
- appropriate application of technology
- student access to learning resources
- faculty training & support services
- standards for faculty-student interaction
- assessment of student learning outcomes

Preserving the Values & Goals of Higher Education

"the main task of the university has been to challenge fundamental assumptions and practices...the university's commitment is to knowledge and research, not to a particular content or to specific results"

-Gerhard Casper,
President of Stanford U.

Preserving the Values & Goals of Higher Education

Although we will be called upon to utilize new technological tools, ultimately the future of higher education is about:

- Content (curriculum)
- Pedagogy (instructional design)
- Developing minds

Higher Education and Emergent Reality

Basic Functions of Higher Education:

- Bring people together to exchange ideas
- Foster new ways of thinking and understanding our existence
- Create an environment for the unfettered search for knowledge
- Create an "emergent reality"

New Technologies Provide New Tools

Success will depend upon intelligent and creative application of technology

- Robust Virtual Learning Environments
- Incorporation of tools for providing access to sufficient supplementary reference, study and research resources.
- Provide for the truly open-ended search for knowledge

Need for Support Services

- William Geoghegan, IBM
  - "early adopters" vs. mainstream faculty
  - require qualitatively different support services
- Steve Gilbert, AAHE
  - what worked for first 5% of faculty cannot be "scaled up" to meet the needs of all faculty
- Need campus-wide plan for providing support services

Faculty Student Support Service Teams

- Composed of technology specialists, librarians, teaching & learning professionals, and student assistants
- Provide full range of support for transforming curriculum for online delivery
- Foster cross-training among team members
- Encourages student involvement in shaping the application of technology to teaching and learning

Librarians' Role in Developing a Virtual University

Development of Online Instruction requires expertise in Knowledge Management

- Organizing & packaging information
- Understanding how students approach systems, & adapt to unfamiliar interfaces.
- Support services & user aids for learners
- Strong faculty liaison model of service

Information Literacy

- Librarians are leaders in the use of technology for scholarly communication
  - transforming information into knowledge
  - instructing others in the process of meaning-construction

"the kind of learning that is most important to us in higher education is, in fact, this process of transforming information into knowledge" -Bernhard R. Gifford

VLE as Extension of Scholarly Communication Process

Objects of librarianship no longer the static by-products of scholarly communication

- Distinction between instructional tools and scholarly products is disappearing.
- Students & faculty engage in creation, dissemination, retrieval, and interpretation of knowledge
- teaching and librarianship drawn into greater interdependency

Librarians' involvement in development of virtual curriculum

- Must build on strong faculty liaison relationships
- Gain greater familiarity with learning theories appropriate for the online environment
- Develop greater ties with technical support services on campus
- Infuse curriculum with information literacy skills
- Provide support for adapting curriculum to new delivery mechanisms
- Ensure adequate access to supplementary research

Emergent Reality Inherently Unpredictable

- As an emergent phenomenon, the very nature of learning fostered by a virtual university will be qualitatively different than that supported by traditional methods of instruction.

"Nothing - no computer or mind, no means of mathematics, physics, or philosophy - can unravel the emergent pattern" latent in the many parts of an organic, networked vivisystem without actually "playing it out." -Kevin Kelly

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